

NON-PUBLIC?: N

ACCESSION #: 9510300001

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Diablo Canyon Unit 2 PAGE: 1 OF 7

DOCKET NUMBER: 05000323

TITLE: Manual Reactor Trip Due to Heavy Debris Loading and
Damage to Traveling Screens

EVENT DATE: 09/23/95 LER #: 95-002-00 REPORT DATE: 10/23/95

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 040

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10
CFR SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Donald H. Behnke - Senior Regulatory SERVICES ENGINEER
TELEPHONE: (805) 545-2629

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On September 23, 1995, at 0911 PDT, with Unit 2 in Mode 1 (Power Operation) at approximately 40 percent power, plant operators initiated a manual Unit 2 reactor trip when the traveling screens stopped running due to excessive debris loading. The unit was stabilized in Mode 3 (Hot Standby) in accordance with emergency procedures. A 4-hour, non-emergency report was made to the NRC at 1207 PDT in accordance with 10 CFR 50.72(b)(2)(ii).

The root cause of the event was excessive debris loading on the circulating water system traveling screens during a period of high seas that dislodged plant life from the ocean bottom.

Abnormal Operating Procedure AP-7, "Degraded Condenser," was revised to include further guidance on minimizing screen damage and the requirement to reduce reactor power during periods of heavy screen loading. Additional screen rakes will be added to the screens to improve the efficiency of debris removal. Simulator training will be provided to operators dealing with the loss of circulating water system screen functions.

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END OF ABSTRACT

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I. Plant Condition

Unit 2 was in Mode 1 (Power Operation) at 40 percent power.

II. Description of Problem

A. Summary

On September 23, 1995, at 0911 PDT, with Unit 2 in Mode 1 (Power Operation) at approximately 40 percent power, a manual Unit 2 reactor trip was initiated when the traveling screens stopped running due to excessive debris loading. The unit was stabilized in Mode 3 (Hot Standby) in accordance with emergency procedures. A 4-hour, non-emergency report was made to the NRC at 1207 PDT in accordance with 10 CFR 50.72(b)(2)(ii).

B. Background

The circulating water system provides a continuous saltwater supply to the main condenser (KE), condensate cooler (KE)(HX), service water cooling system (BI), and intake cooling system (KE). The saltwater enters the cooling water intake structure by passing through bar racks and then through traveling screen assemblies. Each unit has two, single-stage circulating water pumps (CWP) and each CWP has three traveling screens. CWP 2-1 is protected by traveling screens 2-1, 2-2, and 2-3. CWP 2-2 is protected by traveling screens 2-4, 2-5, and 2-6. The bar racks and traveling screens prevent floating debris and sea life from entering the system and restricting flow through the main condenser.

The screens for the CWP's are operated either in manual or automatic. When in manual, the screens are controlled by the operator and can be operated in slow or high speed. When in automatic, the screens are started either periodically by a timer or upon demand by level instrumentation that monitors differential pressure (dp) of seawater across the screens. The dp is measured in inches of water. The level instrumentation starts the screens in slow or high speed when screen dp reaches 12 inches and 24 inches, respectively. Any automatic start signal initiates a screens running alarm in the control room even if the screens are in manual control.

C. Event Description

On September 22, 1995, Unit 2 was at 100 percent power. The intake structure traveling screens for the circulating water system were operating

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continuously in manual due to high seas forecast through the weekend. Debris dredging in the intake cove had been performed during daylight hours.

On September 23, 1995, at 0011 PDT, the control room operators notified PG&E power control of debris loading on the traveling screens at the intake and that a potential existed for reducing power on Unit 2.

At 0135 PDT, the operators commenced a ramp down to 50 percent power due to high bar rack dp (of 15 inches) combined with high screen dp (varying to 20 inches) with screens 2-1 through 2-6 in manual and continuously in high speed.

By 0331 PDT, the operators were holding Unit 2 at 50 percent power. Debris loading and screen dp had diminished on the screens for CWP 2-1 (screens 2-1, 2-2, and 2-3) such that the screens were operating in manual slow speed. The screens for CWP 2-2 (screens 2-4, 2-5, and 2-6) remained in manual high speed. Attempts to place CWP 2-2 screens into manual slow speed resulted in rapidly increasing dp.

At 0700 PDT, CWP 2-1 and CWP 2-2 screens remained in slow and high speed, respectively, with screen dps of approximately 2 to 5 inches. Bar rack dp was 15 inches and some waves were observed to be coming over the breakwater.

At 0849 PDT, the control room received an alarm caused by an automatic start signal to the screen drives which is generated when dp across the traveling screens increases to greater than 12 inches. The control room operators entered annunciator response procedure AR PK-13-01, "Bar Racks/Screens" and abnormal operating procedure OP AP-7, "Degraded Condenser." The control room operators contacted the intake operator who verified Unit 2 screen drives were running.

CWP 2-2 screens were observed shortly thereafter to have stopped running. After checking the breakers for the screen

drives, the operator checked the screen dp and found it to be 105 inches. CWP 2-1 screens were manually taken to fast speed.

At 0902 PDT, the control room operators shut down CWP 2-2 because the associated traveling screens were no longer operating, and motor current was low and oscillating.

At 0905 PDT, control room operators commenced another ramp down at 5 MW/min. When the intake operator reported increasing screen dps on CWP 2-1, the ramp rate was eventually increased to 100 MW/min.

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At 0911, the intake operator notified the control room that all traveling screens for CWP 2-1 had stopped, that damage had occurred to the 2-1 screen, and recommended tripping the CWP. At approximately 40 percent power, the shift foreman ordered the reactor tripped and the shutdown of CWP 2-1. The main steam isolation valves (MSIVs) were closed and Emergency Operating Procedure E-0 was entered.

With the MSIVs closed, steam generator (S/G) pressure increased to 1030 psig. Subsequent to this, the control room staff and others observed several S/G relief valves (RVs) lifting on S/Gs 2-1 and 2-2.

At 1004 PDT, RVs 3 and 7 were identified as lifting on S/Gs 2-1

and 2-2. The 10 percent steam dump valve setpoints were lowered to reduce S/G pressure to approximately 960 psig in an effort to keep the relief valves from lifting. The shift foreman authorized gagging of RVs 3 and 7 due to premature lifting. RV-7 was then gagged at 1053 PDT, and RV-3 was gagged at 1131 PDT. S/G pressure was then allowed to return to the normal atmospheric steam dump setpoint of 1035 psig. Shortly thereafter, RV-11 on S/G 2-3 lifted and subsequently reseated.

At 1150 PDT, using the 10 percent steam dumps, operators started cooling down the reactor coolant system (RCS) to lower S/G pressure in order to keep the remaining RVs from lifting. Operators stabilized the RCS temperature at 530 degrees F and S/G pressure at 900 psig.

At 12:07 PDT, a 4-hour non-emergency report was made to the NRC in accordance with 10 CFR 50.72(b)(2)(ii).

D. Inoperable Structures, Components, or Systems that Contributed to the Event:

None

E. Dates and Approximate Times for Major Occurrences:

1. September 23, 1995, at 0135 PDT: Unit 2 power ramp down initiated.
2. September 23, 1995, at 0902 PDT: CWP 2-2 shut down.

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3. September 23, 1995, at 0911 PDT: Event/Discovery Date:
Unit 2 manually tripped

at approximately 40
percent power.

4. September 23, 1995, at 1207 PDT: A 4-hour, non-emergency
report was made to the
NRC in accordance with
10 CFR 50.72(b)(2)(ii).

F. Other Systems or Secondary Functions Affected:

S/G RVs 3 and 7 lifted and were subsequently gagged. RV-11
also lifted but reseated (reference LER No. 1-95-011-00).

G. Method of Discovery:

The event was immediately apparent to plant operators due to
alarms and indications received in the control room.

H. Operator Actions:

Licensed plant operators in the control room responded in
accordance with established emergency procedures. They
confirmed the reactor trip, verified proper engineered safety

feature actuations, and initiated manual actions to stabilize the unit in Mode 3.

H. Safety System Responses:

1. The reactor trip breakers (JC)(BKR) opened.
2. The main turbine tripped.
3. The control rod drive mechanism (AA)(DRIV) allowed the control rods to drop into the core.
4. Four 10 percent steam dump valves opened to relieve pressure.
5. S/G relief valves lifted.
6. Auxiliary feedwater was initiated.

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III. Cause of the Problem

A. Immediate Cause:

The immediate cause of the manual reactor trip was anticipated turbine trip and loss of vacuum, which would result from securing the only remaining CWP.

B. Root Cause:

The root cause of the event was excessive debris loading on the circulating water system traveling screens during a period of high seas that dislodged plant life from the ocean bottom.

IV. Analysis of the Event

The effect of the S/G RVs lifting is discussed in LER No. 1-95-011-00.

A manual reactor trip from 40 percent power is a previously analyzed FSAR Update, Chapter 15, Condition 11 event. The ten percent steam dump valves, the MSSVs, and the pressurizer controlled the reactor coolant temperature and pressure in accordance with plant design basis. Therefore, the health and safety of the public were not adversely affected by this event.

V. Corrective Actions

A. Immediate Corrective Actions:

1. The damaged traveling screens were repaired.
2. The S/G RVs were retested (reference LER 1-95-011-00) and an emergency technical specification change was requested and granted prior to restart. (Reference License Amendments 108 and 107 for Diablo Canyon Units 1 and 2, respectively.) These amendments increase the setpoint

tolerance of the RVs from 1 percent to 3 percent, with the exception that the lowest set RVs would have a tolerance of -2 percent/ percent.

B. Corrective Actions to Prevent Recurrence:

The following are near term actions designed to reduce overall plant impact and damage to equipment. However, PG&E does not expect that future reactor trips can be avoided when high seas and dislodged plant life from the ocean bottom result in heavy debris loading on the traveling screens.

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1. Abnormal Operating Procedure AP-7, "Degraded Condenser," was revised to:

a. Require CWP shutdown if screen dp exceeds 50 inches to minimize the potential for damage to the CWP screens. Previously, shutdown of the CWP was required after the screens had stopped running.

b. Include a requirement to reduce reactor power during periods of heavy screen loading, as was done on the night of September 23, 1995.

2. PG&E will install additional "Kelp Rakes" to each traveling screen to improve the efficiency of debris

removal.

3. PG&E will provide operators with simulator training dealing with loss of CWP screen functions.

VI. Additional Information

A. Failed Components:

Intake traveling screens.

B. Previous LERs on Similar Problems:

LER 2-94-012-00, "Manual Reactor Trip Due to Circulating Water Pump Cavitation as a Result of Intake Screen Fouling."

Most of the corrective actions for the LER were focused on minimizing and responding to debris carryover from the traveling screens and subsequent fouling of the condenser. For example, devices were installed to minimize bypass flow around the traveling screens (foot deflectors and side-shields) in order to improve their efficiency. Additional procedural guidance was provided to reduce power based on condenser fouling, and to display condenser fouling indication in the control room.

During the event of September 23, 1995, the screens effectively prevented any condenser fouling from occurring. This event resulted in a significantly different challenge to the screen wash system than the trip of December 12, 1994. Thus, the

corrective actions taken to prevent recurrence of the December 12, 1994, event were not effective in preventing the September 23, 1995, event.

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October 23, 1995

PG&E Letter DCL-95-230

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Docket No. 50-323, OL-DPR-82
Diablo Canyon Unit 2
Licensee Event Report 2-95-002-00
Manual Reactor Trip Due to Heavy Debris Loading and Damage to Traveling
Screens

Gentlemen:

Pursuant to 10 CFR 50.73(a)(2)(iv), PG&E is submitting the enclosed Licensee Event Report concerning a manual reactor trip due to anticipated loss of circulating water and turbine trip. This event did not adversely affect the health and safety of the public.

Sincerely,

Gregory M. Rueger

cc: Steve Bloom

L.J. Callan

Kenneth E. Perkins

Michael T. Tschiltz

Diablo Distribution

INPO

Enclosure

N0001925

WEC/2246

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